FIG. **12** shows a bottom view of sensor **120**, greatly enlarged, having body **170** formed from the hydrogel of the present invention. Light emitter **125** and receiver **135** are linearly aligned and are each connected to measurement unit **80** by their own lines (electric wires) **140**. The function and operation of the sensor device is explained below.

The small dimensions of the sensor **120** and its ease of handling permit sensor **120** to be introduced through the vagina and attached to the presenting part of the fetus at a very early stage of labor. To do so, sensor **120** is pressed lightly at the center against the head of fetus **100**, for example, by a moving forward a handle having a polygonal profile (not shown) on the distal end that fits into the polygonal profile **165** of cup **150**.

Body **170** is pressed onto the fetal tissue by a forward motion of sensor **120**. Since body **170** attaches without invading the fetal tissue, no impairment in the fetal tissue is caused. The forward force is transmitted directly by way of the polygonal profile and metal plate **155** to body **170**.

When sensor **120** is pressed at the center against the fetal tissue, the peripheral zone **111** of cup **150** is the first to come in contact with the fetal tissue. The peripheral zone **111** then undergoes elastic deformation and the curvature of cup **150** is reduced. The hydrogel adhesive permits the peripheral zone **111** of cup **150** to yield in an elastic, spring-loaded manner when sensor **120** is pressed against the fetal tissue such that peripheral zone **111** rests on the fetal tissue with a slight initial tension. When body **170** has been pressed onto the fetal tissue, the slight initial tension caused by peripheral zone **111** of cup **150** on the fetal tissue causes the surfaces of light emitter **125** and receiver **135** to be in contact with the fetal tissue.

Attachment zone **110** is also pressed by body **170** against the fetal tissue. The pressing of sensor **120** against the fetal tissue thus takes place very gently but tightly at the center as well, but in any case this prevents any impairment of the fetal arterial blood flow in the area of peripheral zone **111**.

As shown in FIG. **10**, a tab-shaped ear **119** that projects radially outward beyond cup **150** and covers the fetal tissue in this area to prevent light from entering or being emitted can be attached in the area of emitter(s) **125** and/or receiver (s) **135**. The light propagates radially beyond the area of cup **150** in an area of approximately 8 mm in the fetal tissue. Therefore, it is advantageous to cover this area with ears **119**.

The attachment of sensor **120** to the fetal tissue using the conductive hydrogel of the present invention permits parts which are electrically insulated with respect to each other, namely metal plate **155** and body **170**, to be used as electrodes, for example, as ECG electrodes.

The especially simple design of sensor **120** and its very small shape should be emphasized. Sensor **120** can be produced very easily and economically (as a disposable item). Nevertheless, sensor **120** fulfills the need for a non-invasive, reliable, and durable means of attachment to the fetal tissue and satisfactory reception of signals for the purpose of measuring vital parameters of a fetus during labor and delivery.

Although illustrated and described herein with reference to certain specific embodiments, the present invention is nevertheless not intended to be limited to the details shown. Rather, various modifications may be made in the details within the scope and range of equivalents of the claims and without departing from the spirit of the invention.

What is claimed:

1. In a process for producing a medical device attaching to a patient, the improvement comprising the steps of:

applying a coating of a precursor composition comprising acrylic acid monomer and an alcoholamine to said medical device; and

polymerizing said precursor composition to produce a hydrogel which is adhesive under both wet and dry conditions.

2. A process as recited in claim **1** wherein said alcoholamine is diisopropanolamine.

3. A process as recited in claim **2** wherein said device is a fetal pulse oximeter sensor attaching to a presenting part of a fetus and monitoring at least one fetal parameter during labor and delivery.

4. A process as recited in claim **2** wherein said precursor further comprises water, a photoinitiator, and a crosslinking agent.

5. A process as recited in claim **4** wherein said device is a fetal pulse oximeter sensor attaching to a presenting part of a fetus and monitoring at least one fetal parameter during labor and delivery.

6. A process as recited in claim **2** wherein said precursor comprises up to about 40% water, up to about 30% acrylic acid, 0.3–0.4% photoinitiator, 0.05–0.20% crosslinking agent, and up to about 30% diisopropanolamine.

7. A process as recited in claim **6** wherein said precursor comprises about 29% water, about 25% acrylic acid, about 0.35% 2-hydroxy-2-methyl-1-phenyl-propane-1-one, about 0.10% polyethylene glycol (400) diacrylate, and about 24% diisopropanolamine.

8. A process as recited in claim **6** wherein said precursor comprises about 39% water, about 29% acrylic acid, about 0.35% 2-hydroxy-2-methyl-1-phenyl-propane-1-one, about 0.10% polyethylene glycol diacrylate, and about 28% diisopropanolamine.

9. A process as recited in claim **6** wherein said precursor comprises about 35% water, about 18% acrylic acid, about 0.35% 2-hydroxy-2-methyl-1-phenyl-propane-1-one, about 0.10% polyethylene glycol (400) diacrylate, and about 30% diisopropanolamine.

10. A process as recited in claim **6** wherein said precursor comprises about 39% water, about 16% acrylic acid, about 0.35% 2-hydroxy-2-methyl-1-phenyl-propane-1-one, about 0.15% polyethylene glycol (400) diacrylate, about 28% diisopropanolamine, and about 13.0% vinyl pyrrolidone.

11. A process as recited in claim **6** wherein said precursor comprises about 25% water, about 19% acrylic acid, about 0.35% 2-hydroxy-2-methyl-1-phenyl-propane-1-one, about 0.10% polyethylene glycol (400) diacrylate, and about 8% diisopropanolamine.

12. A process as recited in claim **6** wherein said precursor comprises about 11% water, about 22% acrylic acid, about 0.33% 2-hydroxy-2-methyl-1-phenyl-propane-1-one, about 0.17% polyethylene glycol (400) diacrylate, and about 14% diisopropanolamine.

13. A process as recited in claim **6** wherein said precursor comprises about 38% water, about 16% acrylic acid, about 0.35% 2-hydroxy-2-methyl-1-phenyl-propane-1-one, about 0.15% polyethylene glycol (400) diacrylate, about 28% diisopropanolamine, and about 13% vinyl pyrrolidone.

14. A process as recited in claim **6** wherein said device is a fetal pulse oximeter sensor attaching to a presenting part of a fetus and monitoring at least one fetal parameter during labor and delivery.

15. A process as recited in claim **1** wherein said hydrogel is conductive.

16. A process as recited in claim **1** wherein said device is a non-invasive fetal probe attaching to a presenting part of a fetus and monitoring at least one fetal parameter during labor and delivery, said probe comprising:

a body having a surface adapted for securing the probe to the fetus to be monitored, said body comprised of said hydrogel which is adhesive under both wet and dry conditions;

a sensor carried by said body and detecting at least one fetal parameter; and